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TAXONOMIC STUDIES ON EPHEMERIDA, I: DESCRIPTION OF NEW NORTH AMERICAN SPECIES

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Through the kindness of the Natural History Survey of Oklahoma the author received for study an interesting collection of Ephemerida. There was included in the material a new species of the genus *Ephemera* which he takes great pleasure in naming in honor of Dr. Jay Traver. In addition there are described in this paper two other new species of North American mayflies which have been collected from various localities as well as critical notes on the taxonomy of *Iron pleuralis* and *I. longimanus*.

Siphloplecton costalense, new species

Figure 3

IMAGO (dried) ♂.—Eyes blackish; head fuscous except distal half of clypeofrontal area, posterior edge of genae, the three ocelli and the antennal sclerites, all of which are light buff. Thorax fuscous except for four light areas as follows: (1) an area on the mesoscutellum; (2) a band which extends ventrally from the anterolateral corners of the mesonotum, meeting at the mid-ventral line and including the prothoracic coxae; (3) a band which extends ventrally from the bases of the mesothoracic wings and also meets at the mid ventral line, and includes the mesothoracic coxae; (4) a similar band on the metathorax. All trochanters fuscous; all femora fuscous except for a light area medially and another one distally. Fore tibia dilute fuscous; meso- and metathoracic tibia fuscous in basal half and translucent buff distally. Tarsal joints of fore legs dilute fuscous with slightly darker joinings; tarsal joints of meso- and metathoracic legs translucent buff with darker joinings.

Longitudinal veins of fore wing fuscous; the MA from the junction of the Rs to fork and the CU_1 most of its entire length darker than other longitudinal veins. Cross veins of anterior two-thirds of disk and costal region margined and pigmented with fuscous black. Other cross veins fuscous but lacking margination. Small fuscous black clouds between the R_1 and R_2 in the stigmal area and at the forking of the MA. The wing membrane of the anal area posterior to CU_2 is fuscous black. Hind wing with a fuscous black cloud extending diagonally from base of wing to middle of costal area. Venation pigmented similarly to that of fore wing except that distal cross veins are transparent.

First abdominal segment wholly fuscous; segments 2–6 semi-transparent with the following markings: (1) purplish ganglionic spots; (2) fuscous infuscations which

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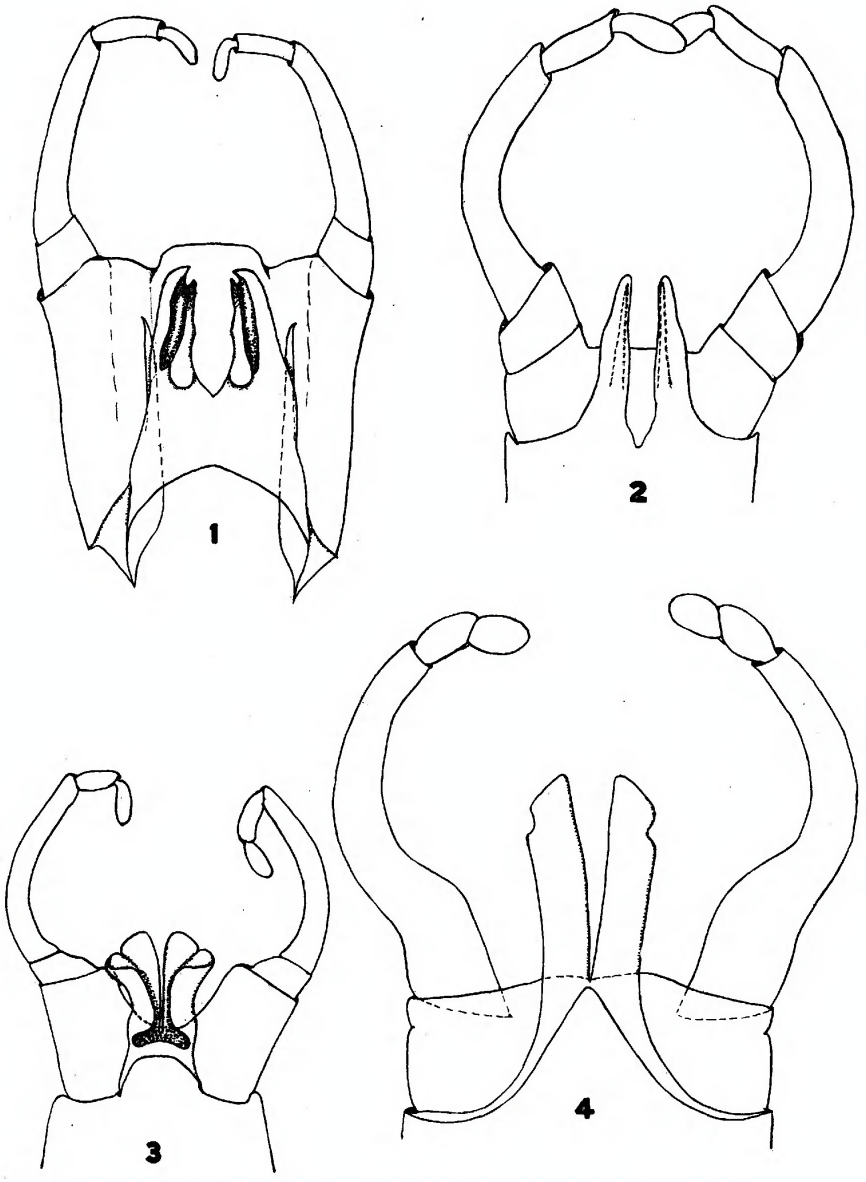


Fig. 1. Dorsal view of the genitalia of *Parameletus columbiae* McD.
Fig. 2. Dorsal view of the genitalia of *Ephemera traveri*, new species.
Fig. 3. Dorsal view of the genitalia of *Siphloplecton costalense*, new species.
Fig. 4. Dorsal view of the genitalia of *Choroterpes fusca*, new species.

extend anteriorly from base of tergites along medial and lateral areas; (3) two submedial fuscous spots on each tergite. Sternites 7 and 8 opaque, light ochraceous except that the medial part of 8 is clouded with fuscous and that both have dark ganglionic spots. Sternite 9 wholly fuscous except for light lateral areas. Tergites 7 and 8 fuscous except for light-colored posteriorly directed triangular areas which are based laterally on anterior margins of tergites. Tergite 9 wholly fuscous except for a bare indication of a similar light triangular area. Segment 10 fuscous except for sides which are wholly light cream colored. Genital apparatus (Fig. 3) wholly fuscous; caudal cerci translucent pale fuscous with darker opaque joinings. Length 11 mm., fore wing 11.5 mm., hind wing 5 mm.

IMAGO (dried) ♀.—Similar to male in maculation except that the fuscous black clouds which are found at the bases of the male's wings are completely lacking. In all other respects, except the usual differences between the sexes, similar to the male. Length 13 mm., fore wing 14 mm., hind wing 6 mm.

VARIATIONS.—As is usual for the Ephemerida when a large series of individuals of any species from a given locality is considered, there is some variation in the color pattern. Some paratypes are darker than the holotype due not only to deeper intensities of the dark colors but also to the tendency of the dark areas to encroach upon the light ones. There are other paratypes where the reverse is true. The holotype was selected because it seemed to be average insofar as coloration is concerned.

HOLOTYPE.—♂, Courtland, Va., April 17, 1935 (H. T. Spieth), in Amer. Mus. Nat. Hist. Coll.

ALLOTYPE.—♀, Courtland, Va., April 17, 1935 (H. T. Spieth), in Amer. Mus. Nat. Hist. Coll.

PARATYPES.—76 ♂, Courtland, Va., April 17, 1935 (H. T. Spieth), 10 in Amer. Mus. Nat. Hist. Coll.; 2 in Cornell Univ. Coll.; 2 in Mus. of Zool., Univ. of Mich. Coll.; 62 in author's collection.

This species is closely related to *S. interlineatum* Walsh but differs from it in having a greater expanse of light areas on the thorax and also in having dark maculation on the posterior sternites. The genitalia differ from those of *S. basale* Walker in that the penes, while lacking spines, are broadest distally.

The distribution of *S. costalense* is interesting. Its nearest relative, *S. interlineatum*, lives in the upper Mississippi River drainage. Traver has reported *S. signatum* from North Carolina and *S. speciosum* from Georgia, both of which are quite distinct and easily differentiated from *S. costalense*. *S. basale*, the best-known species of the genus, is northern in distribution but ranges into the southern highlands. Thus *S. costalense* is geographically separated from its nearest relative by more remotely related species. Such a type of distribution is fairly common in other groups, but so far as can be determined this is the first time it has been reported in the Ephemerida.

In connection with the other species of *Siphloplecton*, it seems worth noting that nymphs of *S. basale* collected at Lakehurst, N. J., show a

mixed population of which a large percent are atypical for the species, especially in that they lack the three longitudinal dark stripes on the abdominal sternites, retaining only the medial stripe. A small percentage, however, are quite typical. The adults from Lakehurst, although differing somewhat from the typical *S. basale*, nevertheless clearly belong to that species. Further collecting will probably show that two geographical subspecies meet in the Lakehurst region. It should therefore be observed that that part of the key to nymphs in "The Biology of Mayflies" by Needham and Traver which deals with *S. basale* is useful only when typical specimens are available.

Choroterpes fusca, new species

Figure 4

IMAGO (dried) ♂.—Head piceous; basal joints of antennae fuscous; flagellum lighter. Prothorax and synthorax shining fuscous black except for some pleural sutures and the coxae which are fuscous. Legs except coxae translucent gray, becoming progressively lighter distally except for meso- and metathoracic tarsi which are slightly darker. A blackish mark submedianly on femur and likewise at the femoral-tibial articulation. Fore wing membrane hyaline except for the costal and subcostal areas proximal to the humeral cross veins which are tinged with fuscous. Costal, subcostal and radial veins tinged with fuscous; other longitudinal veins as well as the cross veins hyaline; cross veins practically invisible. The coloration of the hind wings is similar to that of fore wings.

Abdominal tergites fuscous over all except for the following lighter colored areas: (1) a discontinuous mid-dorsal light line on segments 2–8, widest on 3 and 4; (2) submedial oval spots on segments 2–7; (3) ventral and lateral to these submedial areas on segments 2–8 are roughly triangular areas based on the anterior margins of the tergites. Abdominal sternites 1–7 translucent gray; 8th sternite cream colored with black traces on its anterior and posterior margins; 9th sternite and basal forceps joint fuscous; remainder of forceps cream colored; caudal cerci pale cream color with faintly darkened joints. The genitalia (Fig. 4) are intermediate in structure to those of *C. basalis* and *C. terratoma*. Length 6.5 mm., wing 6.5 mm.

VARIATIONS.—Some of the male paratypes differ from the holotype by having the synthorax and abdomen slightly lighter in coloration.

IMAGO (dried) ♀.—Except for the usual sexual differences and a general lighter coloration, the females are similar to the males. Length 5.5 mm., wing 6.5 mm.

HOLOTYPE.—♂, Algoma, Ontario, September 1, 1934 (H. T. Spieth), in Amer. Mus. Nat. Hist. Coll.

ALLOTYPE.—♀, Algoma, Ontario, September 1, 1934 (H. T. Spieth), in Amer. Mus. Nat. Hist. Coll.

PARATYPES.—10 ♂ and 7 ♀, Algoma, Ontario, September 1, 1934 (H. T. Spieth), 2 in Amer. Mus. Nat. Hist. Coll.; 2 in Mus. of Zool., Univ. of Mich. Coll.; 13 in author's collection. I also have two specimens of the same species from Redding, Conn., July 21, 1933.

This species is close to *C. alliannulata* from which it can be readily

distinguished by the darker abdominal maculation. The lighter color of the fore leg, especially the fore femur, is also a distinguishing feature.

The entire Algoma series was collected about three o'clock in the afternoon while they were engaged in nuptial flight over a small stream. In common with their relatives of the genus *Paraleptophlebia*, the nuptial flight was comparatively close to the surface of the water, in this case about 4 to 12 feet above the stream. Apparently their small size and relatively great transparency protect them from their arch enemies, the insectivorous birds.

Parameletus columbiae McDunnough

Figure 1

McDUNNOUGH, 1938, Can. Ent., LXX, pp. 31–32, Fig. 1.

IMAGO (dried) ♂.—Head fuscous; thorax generally fuscous, a piceous transverse band between fore legs; the tips of the meso- and metascutella tipped with piceous; legs uniformly fuscous with fore coxa, trochanter, femur and tibia being slightly darker than the corresponding parts of the meso- and metathoracic legs. Wings with all neuration bister brown; in fore wings the cross veins of costal and subcostal areas proximal to bulla weak but distinct; distal to bulla, cross veins of costal area are strongly anastomosed; wing membrane wholly hyaline. Tergites of abdomen uniformly bister brown except for a slightly lighter coloration in anterolateral corners. Lateral edges of tergites 8 and 9 light buff. Sternites 1–8 bister brown with lighter anterolateral areas which tend to spread across sternites and fuse. Sternite 9 with bister medial area and fuscous lateral areas. In addition a pair of small lateral fuscous spots on sternites 1–8. Forceps base bister brown with anterolateral corners lighter; distally the forceps base (Fig. 1) is excavated on each side, leaving a central hump; forceps fuscous; penes dark fuscous; cerci uniformly light bister. Length 11 mm.; fore wing 11 mm.

While this paper was in press, McDunnough (Can. Ent., LXX, pp. 31–32, Fig. 1) described this species from material collected at Dunn Peak, North Thompson River, B. C. On July 7, 1936, I collected six specimens at Fishing Bridge on Yellowstone Lake, Wyo., which unquestionably belong to *P. columbiae*. Since McDunnough's material all came from a single locality and differs in a few small details from the Yellowstone material, I have published my description in full so as to give other workers a further knowledge of the amount of variation that is to be found within this species.

Ephemera traveri, new species

Figure 2

IMAGO (in alcohol) ♂.—General coloration bister brown. Head fuscous with pale antennae; pronotum fuscous except for a pale central area and light lateral areas; meso- and metanota light bister brown; pleural sclerites colored like metanota but with sutural areas much lighter; thoracic sternites bister brown; all coxae similar

to metanota in color; trochanter, femur and tibia of fore leg translucent light buffy brown; fore tarsal joints almost colorless; fore tarsal claws light brown; meso- and metathoracic legs, except for coxae, similar to fore tarsi in color. Longitudinal veins of fore wing translucent bister brown; cross veins piceous; anterior half of humeral cross vein between costal border and subcosta colorless while remainder of this vein and all cross veins proximal to bulla broadly infuscated; distal to bulla the entire costal and subcostal membranes are infuscated. A brown fascia extending from bulla to IMP with the part between MA_2 and IMP offset distally from main body and considerably fainter; a brown cloud also between MP_1 and MP_2 at proximal end; cross veins of disk lightly infuscated. Venation of hind wings similar in color to that of fore wings except posterior longitudinal veins are lighter. Distal part of hind wing membrane broadly infuscated. Abdomen dorsally an intense bister brown with the following lighter areas: (1) a slender, discontinuous medial line; (2) just lateral to the medial line on each side are light streaks based on the anterior margins of each segment and posteriorly diverging laterally. On segments 8 and 9 these streaks fuse with the light median line and thus enclose a pair of slender dark patches; (3) segment 10 almost wholly light. Sternites translucent light bister brown, a pair of lateral, discontinuous longitudinal dark stripes which are slightly dilated anteriorly. Basal joint of forceps light bister; remainder of genitalia light. Penes (Fig. 2) slender tapering rods quite different from those of any other known North American species. Cerci light with dark joining. Length 11 mm.; wing 12 mm.

IMAGO (in alcohol) ♀.—The color pattern of the female is similar to that of the male except that it is lighter over all with a tendency for the light areas, especially those of the abdomen and thorax, to encroach on the dark areas. The wings are clearer than those of the male and there is a sharper demarcation between light and dark areas. Length 14 mm.; wing 12 mm.

VARIATIONS.—As is usual with members of this genus, there is considerable variation between individuals in coloration, some showing a tendency toward a reduction in intensity and spread of the bister ground color, which is especially apparent in the wings and the abdomen.

HOLOTYPE.—♂, Flint, Okla., June 19, 1937 (Standish and Kaiser Coll.), in Amer. Mus. Nat. Hist. Coll.

ALLOTYPE.—♀, Flint, Okla., June 6, 1937 (collector unknown), in Amer. Mus. Nat. Hist. Coll.

PARATYPES.—117: 1 ♂, Flint, Okla., June 19, 1937, in Amer. Mus. Nat. Hist. Coll.; 4 ♂ and 9 ♀, Flint, Okla., June 8, 1934, in Amer. Mus. Nat. Hist. Coll.; 4 ♂ and 9 ♀, Flint, Okla., June 8, 1934, in Okla. A. and M. Coll.; 2 ♂ and 9 ♀, Flint, Okla., June 8, 1934, in author's collection; 2 ♂ and 6 ♀, Flint, Okla., June 6, 1934, in Amer. Mus. Nat. Hist. Coll.; 1 ♂ and 69 ♀, Flint, Okla., June 6, 1934, in Okla. A. and M. Coll.; 1 ♂, Flint, Okla., June 6, 1934, in author's collection.

E. traveri can be distinguished from its close relative *E. simulans* Walker by the generally lighter coloration, the distinctive genitalia, the lack of a cloud in the apical part of the radial sector of the fore wing and by the presence of the subdorsal light areas of the abdomen on segments 2–9.

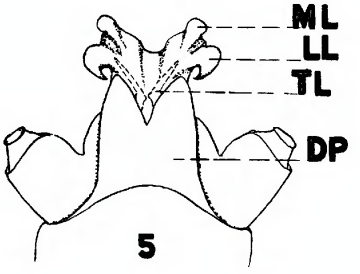
It is to be noted that the holotype apparently was allowed to desic-

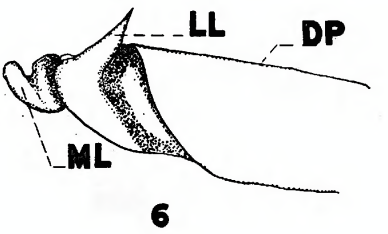
cate before being placed in alcohol. Consequently the abdominal color pattern is not as clear cut as in some of the paratypes. Unfortunately most of the paratypes are in rather poor condition.

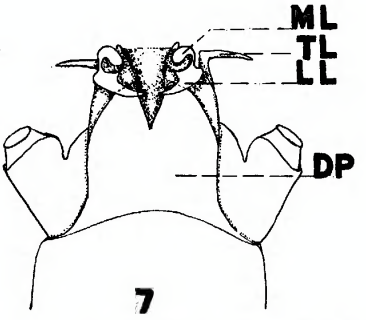
Iron pleuralis Banks

Figures 5 to 8

Banks (1910, Can. Ent., XLII, p. 202) described a new species which he named *Heptagenia* (*Epeorus*) *pleuralis*. Accompanying the brief description was a rather inadequate drawing of the male genitalia. His type material was collected near Gloversville, New York, by Alex-







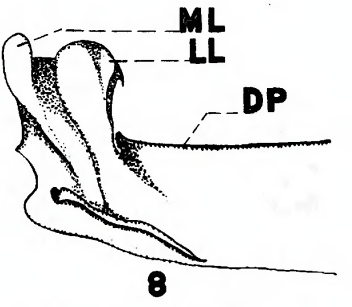


Fig. 5. Dorsal view of the normal penes of *Iron pleuralis* Banks.
Fig. 6. Lateral view of the normal penes of *Iron pleuralis* Banks.
Fig. 7. Dorsal view of the expanded penes of *Iron pleuralis* Banks.
Fig. 8. Lateral view of the expanded penes of *Iron pleuralis* Banks.

Explanation of abbreviations: DP, dorsal plate; TL, titillators; LL, lateral lobes; ML, median lobes.

ander, on May 15, no year given. Ulmer (1920, Stett. Ent. Zeit., LXXXI, [H.II] p. 142) synonymized this species with *Iron longimanus* Eaton. Later workers did not follow Ulmer's synonymy but did accept his placement of the species in the genus *Iron* as correct.

A few years ago, Traver studied the type material and found that the penes of the genitalia do not agree with the forms which are commonly accepted as being typical for *pleuralis*. Utilizing an original paratype of Banks, she redescribed the species (1935, "Biology of Mayflies," pp. 407–408, Fig. 106). The material which had been previously known under the name *pleuralis*, and which she now considered to be without a valid name, was designated by the new name *I. fraudator* (idem, p. 402, Fig. 105). In discussing *fraudator* and *pleuralis*, Traver says of the former: "This species is so similar in general appearance to *I. pleuralis* that we are unable to find any character other than genitalic structure by which to distinguish it. Further, the two species occur together; specimens of both have been taken in the same swarm." My own observations bear out these statements. Invariably, however, in any nuptial swarm *I. pleuralis* is much rarer than *I. fraudator*. For instance, of 72 specimens taken in a nuptial swarm at Blairstown, N. J., only 2 belonged to *I. pleuralis*. Other collections from various localities present the same picture.

That two populations should be able to retain their identity when they are so alike in their ecology and behavior, not to mention their structural similarities, seems doubtful. Accordingly I have thought it worth while to study the single difference that Traver has utilized to separate these two populations: i.e., the penes of the genitalia.

The penes (Fig. 5) of the so-called *I. fraudator* are fused along the median edges so that, instead of the paired structures usually found in the Ephemerida, there is a single more or less tubular structure. As seen from above, the penes terminate distally in two large laterally directed processes, each of which is secondarily divided into two lobes. The most lateral of these ends in a sharp spine, which curves around until it is directed medioanteriorly. This (Fig. 5 LL) I have called the lateral lobe. The median lobe (Fig. 5 ML) ends bluntly and extends posterolaterally. Ventrally (Fig. 5 TL) there is a pair of slender, sharply bent titillators. The dorsal surface of the body of the penes is formed by a heavily scleritized, posteriorly bifid plate (Fig. 5 DP) which I have named the dorsal plate. Viewed laterally (Fig. 6) it can be seen that the tips of the lateral lobes, in addition to being directed anteromedially, are also directed dorsally. The medial lobes, however, extend posteriorly.

On first glance (Figs. 7 and 8), the penes of the so-called *pleuralis* look much different from those of *fraudator*. Careful investigation shows that there are no differences except those which can be accounted for by assuming that the ventral parts of the penes have been expanded

ventrally and laterally while the dorsal part (i.e., the dorsal plate) has remained stationary. Thus, with the distal end of the dorsal plate acting as a pivot (Figs. 7 and 8), the dorsal lobes have been forced dorsally and medially, while the medial lobes have been forced only dorsally. The titillators have been carried posteriorly and laterally so that they now extend laterally. The dorsal plate is completely unaffected by these movements except that the edges are extended due to the lateral expansion of the penes, which makes the dorsal plate appear somewhat wider. Thus the only known difference between *I. pleuralis* and *I. fraudator* disappears and it is consequently necessary to consider *I. fraudator* as a synonym of *I. pleuralis*. It should be noted that the drawings have been made from two individuals collected at the same time during the nuptial flight. All comparable drawings have been made to identical scales.

In the eastern part of the United States, *Iron pleuralis* is the first member of the genus to emerge in the spring. Near New York City, the adults are first seen during the early part of May and are then relatively common until the first of June. In the cooler streams such as are found in the higher elevations of the Catskill and Ramapo mountains, the emergence continues into the middle of June. Ide, in a splendid paper (1935, Univ. of Toronto Studies, Biol. Series No. 39) dealing with the effect of temperature upon the mayflies of the Nottawasaga River and its tributaries, has discussed *I. pleuralis* in detail. He shows, among other things, that a long emergence period at any given locality is definitely associated with a low average temperature of the stream throughout the year. Field observations that I have made on *I. pleuralis* are in no way at variance with Ide's findings. It is evident that this species cannot tolerate high stream temperatures and is consequently lacking from the streams of the New Jersey coastal plain and from many other small lowland streams near New York City.

In this connection, it is interesting to note that in the vicinity of Bloomington, Ind., which is farther south and where the average stream temperatures are fairly high, *I. pleuralis* is able to maintain itself only in the cold clear streams that issue from some of the limestone caves so numerous in this region. During the warm summer months when many of these cave streams almost dry up, no young nymphs of *I. pleuralis* are to be found. Apparently, as Ide suggested, the newly laid eggs of this species remain in a dormant state for a period of time and hatch later in the fall when the temperatures are lower. The young nymphs develop rapidly and by the following May emerge as adults. The most

apparent explanation of how *I. pleuralis* could have reached these cave streams is to assume that at some previous period, perhaps during the last glaciation, stream temperatures in general were much lower in this region so that the species was able to spread throughout the area. With the warming up of the streams, they have all been eliminated except those that retreated to the small cool streams that flow from the caves. The only other feasible explanation is that *I. pleuralis* has gradually evolved from a form which lives in the streams but in a different ecological niche, i.e., lower in the stream and consequently in a region of higher average temperature. Such an explanation does not seem reasonable in view of the fact that no other species of the genus *Iron* lives in these streams. Thus it would be further necessary to assume that after the parent stock gave rise to *I. pleuralis*, it became extinct. This appears unlikely. It therefore seems highly probable that *I. pleuralis* represents a glacial relic in the region of southern Indiana.[1]

Iron longimanus Eaton

The clearing up of the relationship of *I. fraudator* Traver to *I. pleuralis* Banks immediately raises another problem. There exists a western

[1] While this paper was in press McDunnough (Can. Ent., LXX, pp. 23–35) published a paper in which he deals with the validity of *Iron fraudator* Traver and *Iron pleuralis* Banks. In addition to these two species, he also considers *I. confusus* Traver. His conclusions concerning Traver's definition of *I. pleuralis* are identical with mine, i.e., that the apparent difference in the penes as shown by Traver is due to distortion and that in their normal position they are of the typical *longimanus* type. McDunnough had available for study a large series of the true *pleuralis* from Canada, New England and upper New York State as well as paratypes of *I. confusus* Traver and *I. fraudator* Traver. From a study of these he concludes: "I would retain the name *pleuralis* Banks with synonym *confusus* Traver for our Canadian species, leaving *fraudator* as very doubtfully distinct for the present and applied to the larger, darker form from more southerly regions." It happens that the large series I had available for the present paper are from "more southerly regions," i.e., New Jersey and southern New York.

Before discussing these specimens it should be noted that (1) the original colors of the true *pleuralis* Banks will probably never be known since the type specimens were preserved in alcohol and during the years since 1910 have doubtlessly faded; (2) *Iron fraudator* and *I. confusus* differ only in that the thorax and abdomen of *confusus* are light red-brown, while the thorax and abdomen of *fraudator* Traver are dark red-brown. Likewise the venation of the former species is light brown while that of the latter is dark brown. Unfortunately Traver ("Biol. of Mayflies," pp. 398 and 402) made no attempt to keep the two original descriptions comparable in construction, and details that are carefully given for one species are completely omitted in the other description. Thus *confusus* Traver has "tails light yellow-brown, very indistinctly darker at joinings," while *fraudator* has "tails dark brown" but there is absolutely no mention of the *presence* or *absence* of joinings. Such a procedure applies not only to the above-mentioned species but to practically all closely related species discussed by Traver, which reduces the value of her work immeasurably.

In addition to the color differences, McDunnough states that *fraudator* is larger than *pleuralis*. Traver definitely says that the minimum and maximum wing lengths and the minimum body lengths of both species are exactly the same. The only size difference given is in maximum body lengths, where *fraudator* might be 0.5 mm. longer. In this connection it is interesting that Ide (Univ. of Toronto Studies, Biol. Series No. 39, pp. 37–38) clearly shows that in the case of *Iron pleuralis* "the first full-grown nymphs of the season are large, and as the season advances the full-grown nymphs are smaller and reach a minimum size at the height of the emergence and then increase in size towards the end of the season." If the nymphs vary in size there seems no reason to believe that the resultant adults should not also vary in size.

Returning to a consideration of the series from New Jersey and southern New York, it is important to note that while some specimens are as large as those that Traver had for her original descriptions, most of them are smaller. A great many of the individuals are "dark red-brown" in general coloration and thus fit the qualifications of *I. fraudator*, but in every mating swarm there are others which are much lighter and represent typical specimens of *I. confusus* as well as intermediates between the two extremes. The Heptageniidae are notorious for the amount of color variation between individuals of the same species, and members of the genus *Iron* seem not to be exceptions. Thus I feel that the only differences between *confusus* Traver and *fraudator* Traver are individual rather than specific and that both should be considered synonyms of *Iron pleuralis* Banks.

species by the name of *I. longimanus* Eaton which is a close relative of the true *I. pleuralis* Banks. In "The Biology of Mayflies" (p. 408), Traver described a new species, *I. proprius*. Only four badly faded specimens preserved in alcohol were available. They are very similar to *I. longimanus* in all respects except for the genitalia. The latter are almost identical with those possessed by the individuals which Traver considers to be typical of *I. pleuralis*. Thus *I. proprius* Traver bears the same relation to *I. longimanus* Eaton that the so-called *I. fraudator* Traver bears to Traver's concept of *I. pleuralis* Banks. An inspection of several hundred specimens of *Iron* which I collected at various localities in Colorado and Wyoming yielded a few *I. proprius* while the remainder were undoubtedly *I. longimanus*. A careful study of the genitalia of *I. proprius* shows clearly that the penes are identical with those of *I. longimanus* Eaton except that they are in an expanded condition. Structurally, ecologically and numerically *I. proprius* and *I. longimanus* parallel *I. fraudator* and *I. pleuralis*. Consequently *I. proprius* must be considered a synonym of *I. longimanus*.

Why should the penes of some individuals of these two species be "expanded?" At present no adequate answer is available. Perhaps it is the result of convulsive movements that accompany death. Another possibility is that it is a movement of the penes that normally occurs at copulation. It is of interest to note that a specimen of *I. longimanus* from Rocky Mountain National Park shows an intermediate condition between the normal and the "expanded" state.